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**Astilean**

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(54) **LEG-POWERED TREADMILL**

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(US)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 146 days.

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**Related U.S. Application Data**

(60) Provisional application No. 61/280,265, filed on Nov. 2, 2009.

(51) **Int. Cl.**  
**A63B 22/02** (2006.01)

(52) **U.S. Cl.** ..... **482/54**

(58) **Field of Classification Search** ..... 482/23,  
482/37, 51, 54, 69-71, 79; 119/700; 434/247,  
434/255; D21/662, 668-669; **A63B 22/02**  
See application file for complete search history.

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*Primary Examiner* — Loan Thanh

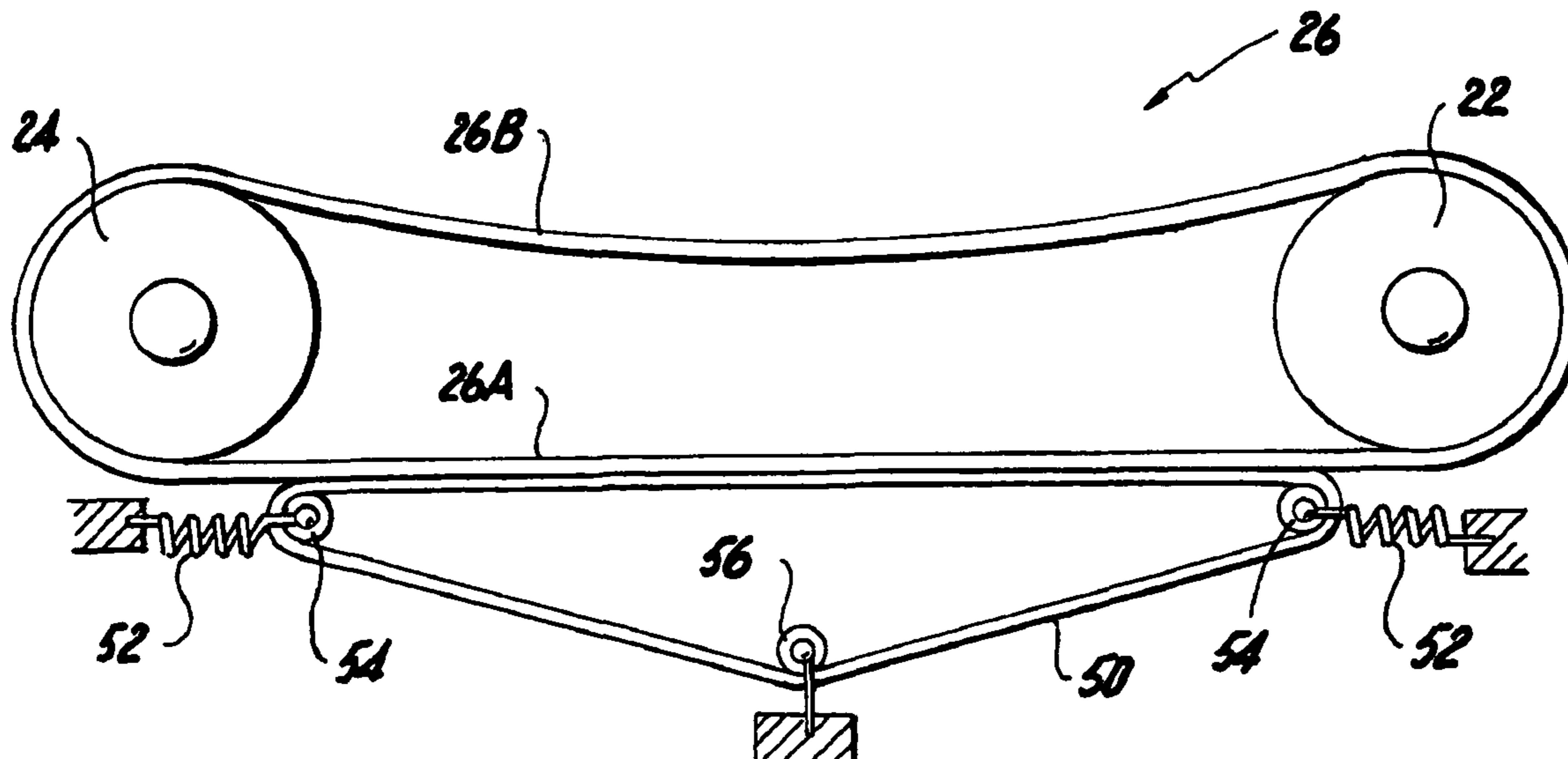
*Assistant Examiner* — Oren Ginsberg

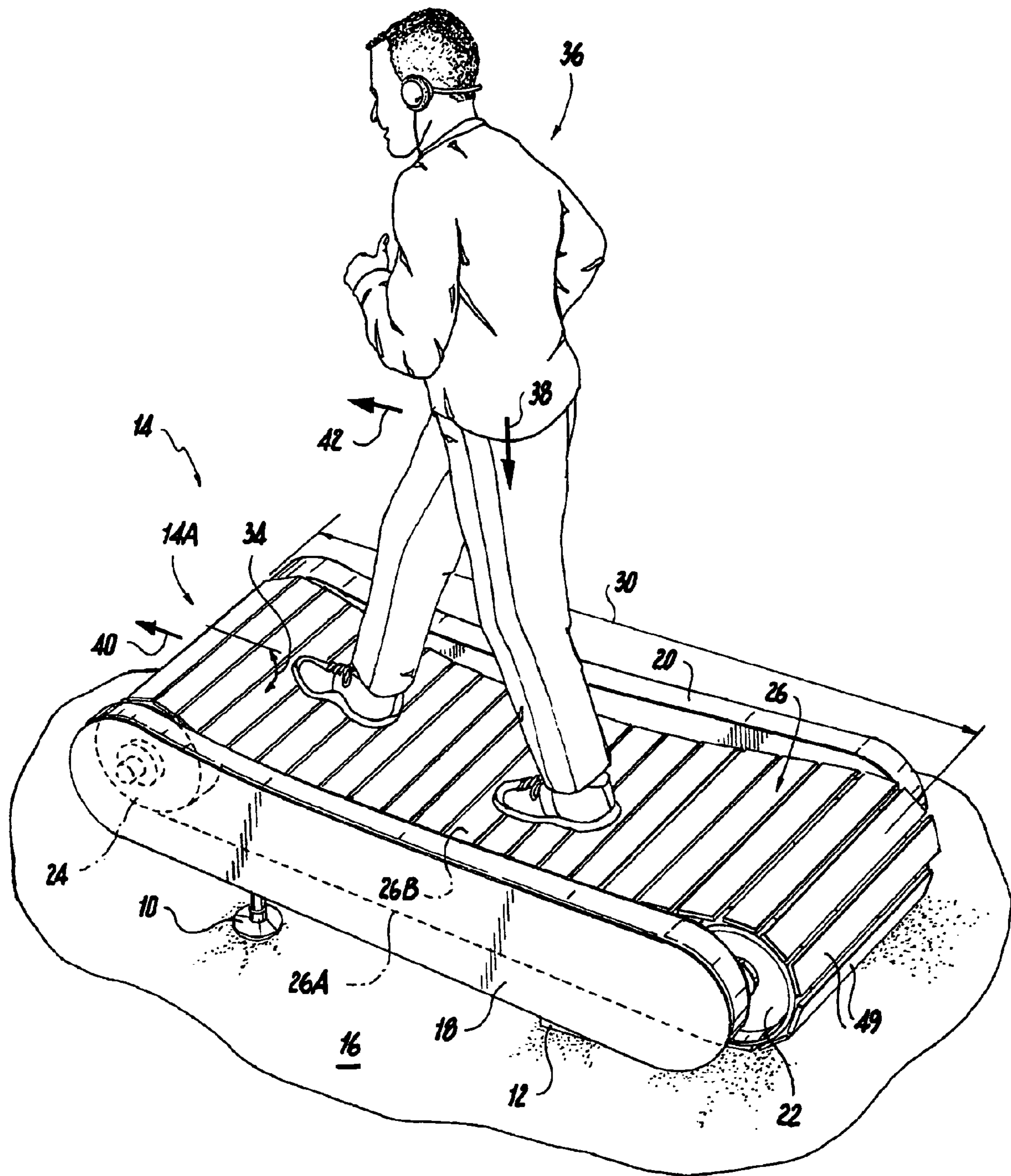
(74) *Attorney, Agent, or Firm* — Alfred M. Walker; Myron Amer

(57) **ABSTRACT**

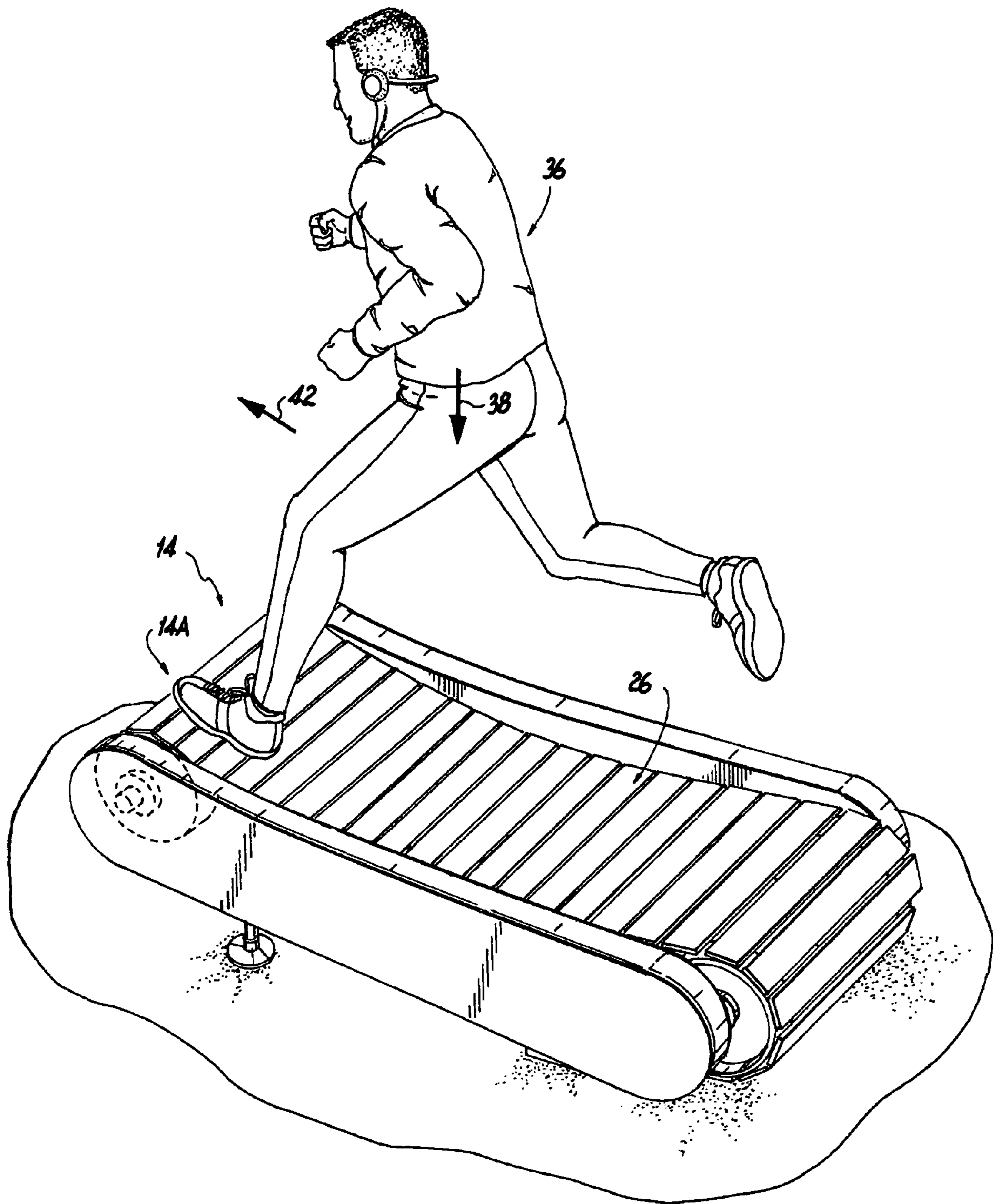
A motor-less leg-powered curved treadmill produced that allows people to walk, jog, run, and sprint without making any adjustments to the treadmill other than shifting the user's center of gravity forward and backwards. A closed loop treadmill belt is formed with a low friction running surface of transverse wooden, plastic or rubber slats attached to each other in a resilient fashion. Since an essential feature of treadmill is the concave shape of the running surface of belt in its respective upper portion, methods are used to insure that this shape is maintained during actual use. These methods prevent the lower portion of the treadmill belt from drooping down (i.e.—it must be held taut), to prevent the top portion to be pulled taut into a flat shape between the front and rear pulley rollers.

**1 Claim, 4 Drawing Sheets**

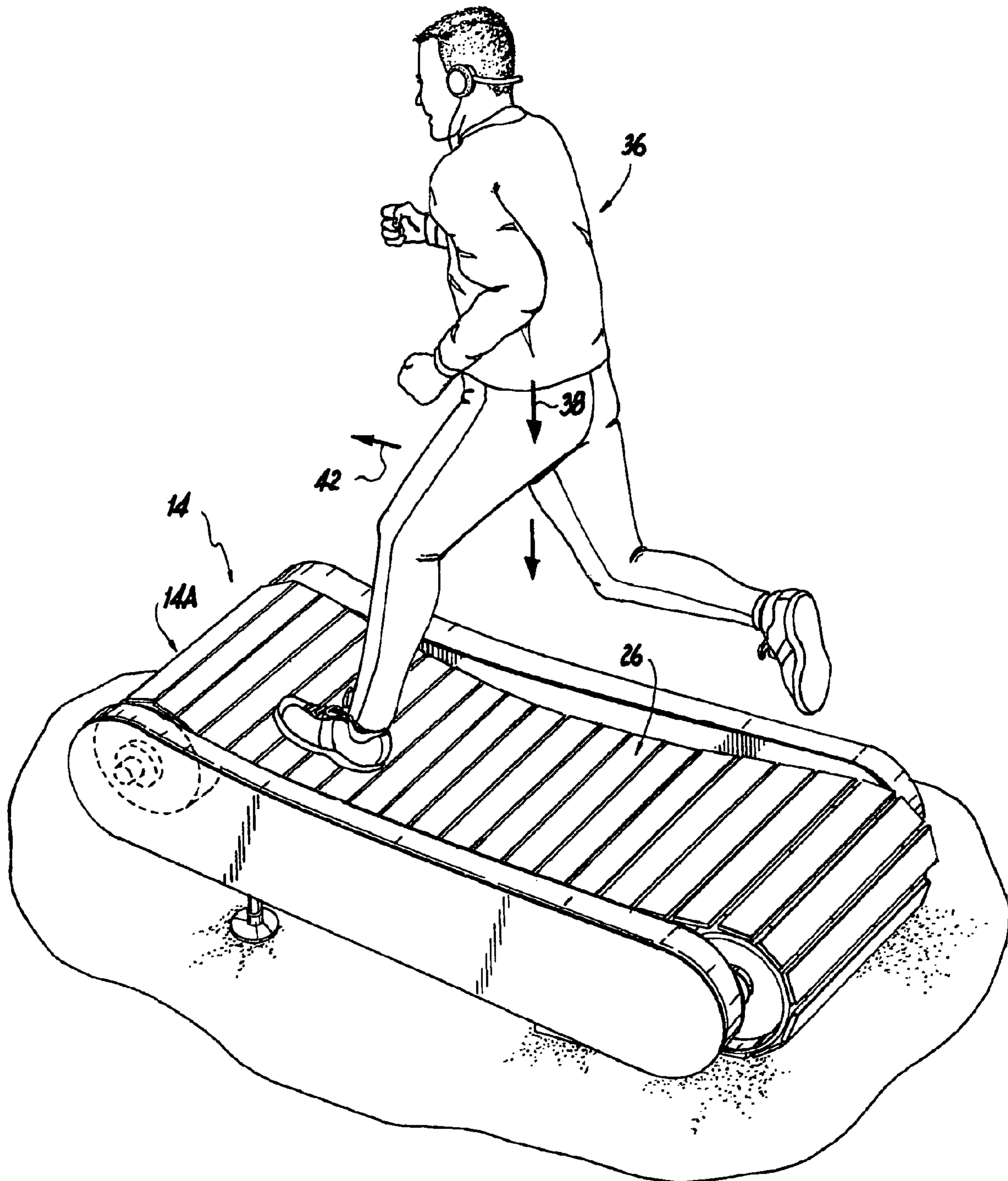




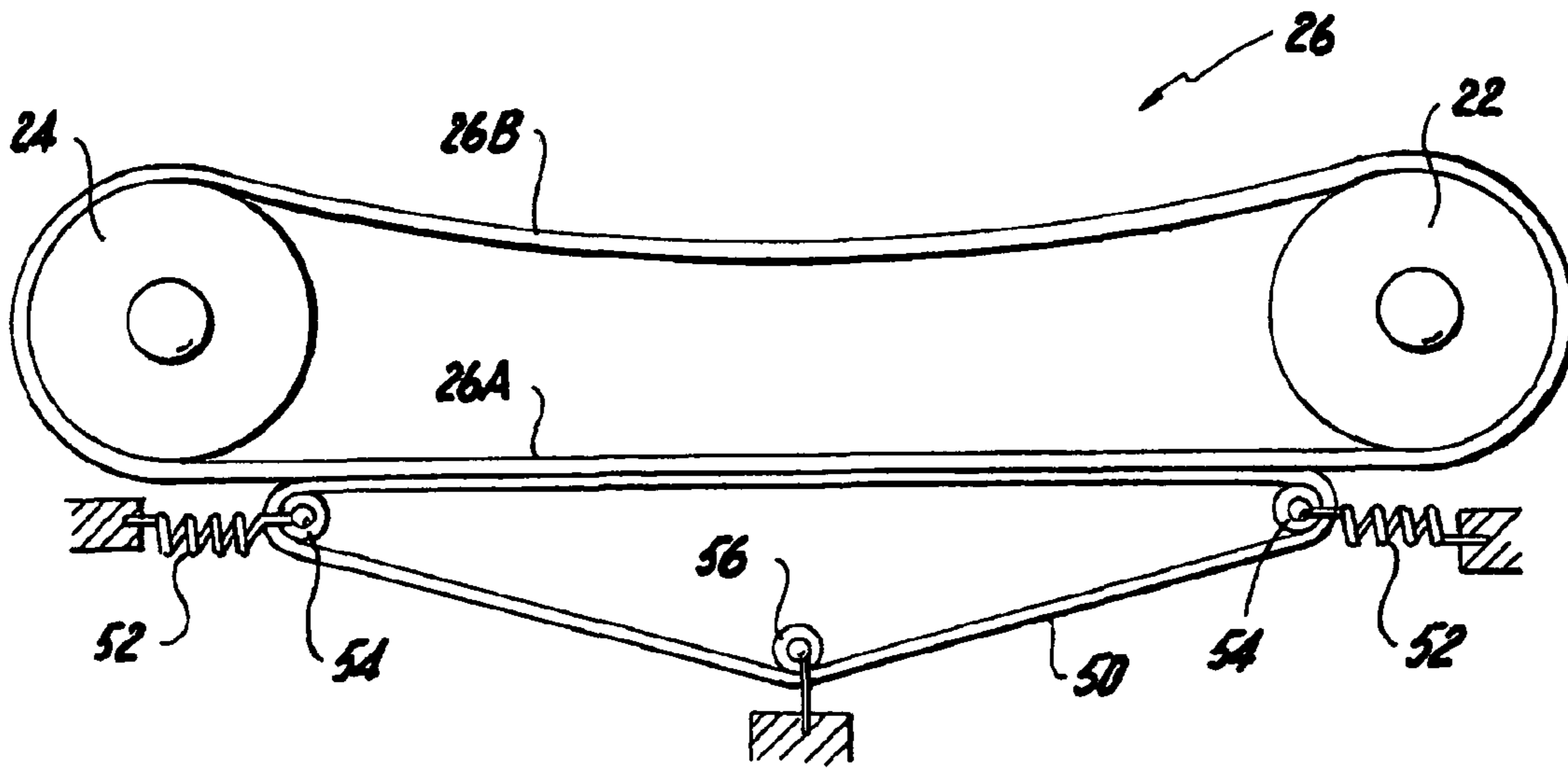
**Fig. 1**



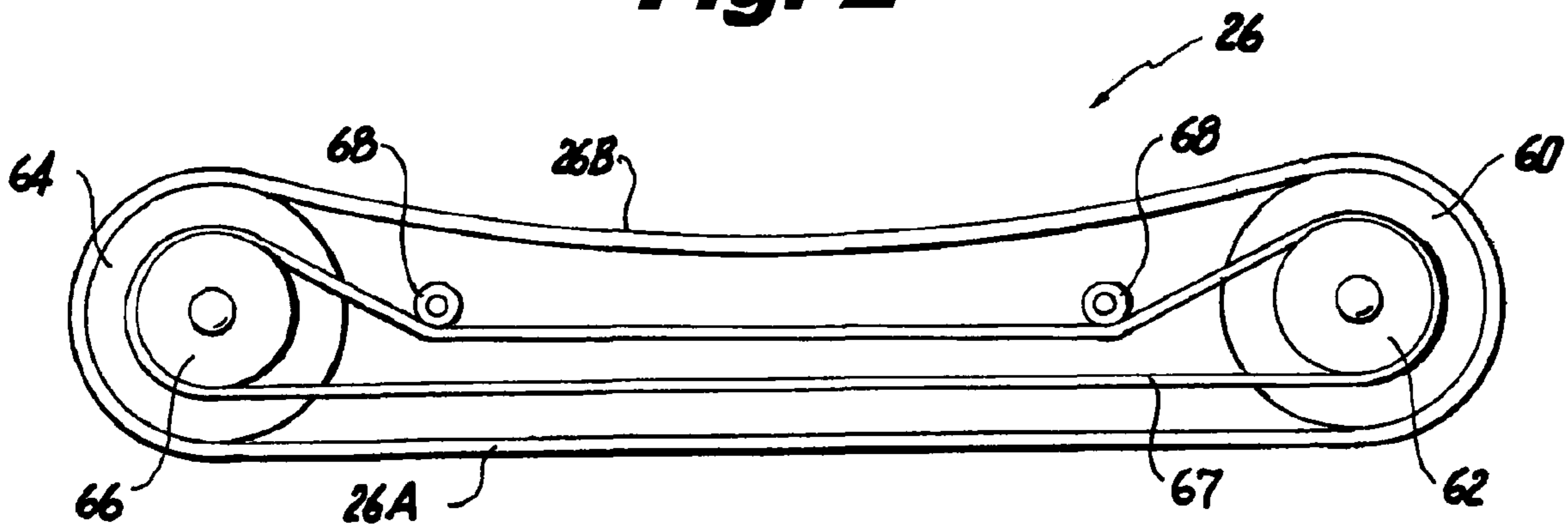
**Fig. 1A**



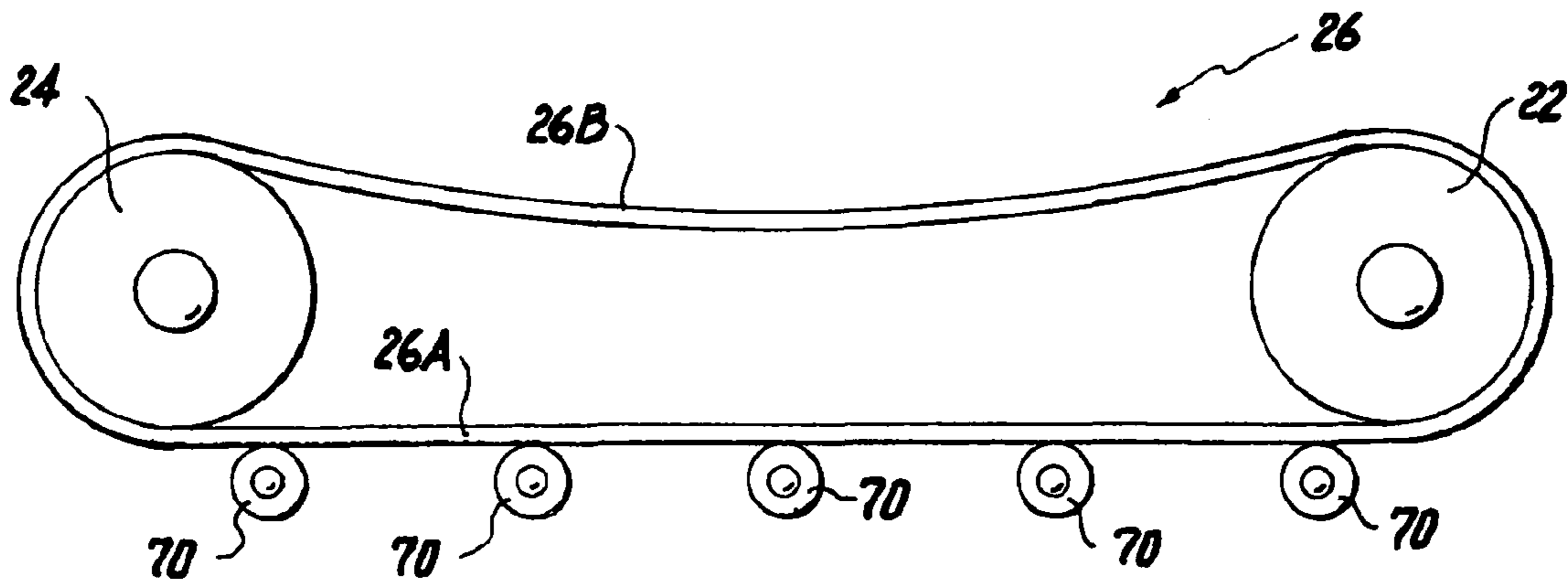
**Fig. 1B**



**Fig. 2**



**Fig. 3**



**Fig. 4**

**LEG-POWERED TREADMILL**

## RELATED APPLICATIONS

This application claims benefit in part under 35 U.S.C. 119(e) from provisional Application No. 61/280,265 filed Nov. 2, 2009, the entire disclosure of which is incorporated by reference herein.

## FIELD OF THE INVENTION

The present invention relates to a motor-less leg-powered treadmill produced that allows people to walk, jog, run, and sprint without making any adjustments to the treadmill other than shifting the user's center of gravity forward and backwards.

## BACKGROUND OF THE INVENTION

Exercise treadmills allow people to walk, jog, run, and sprint on a stationary machine with an endless belt moving over a front and rear sets of pulleys.

## OBJECTS OF THE INVENTION

It is an object of the present invention to provide a motor-less leg-powered curved treadmill produced that allows people to walk, jog, run, and sprint without making any adjustments to the treadmill other than shifting the user's center of gravity forward and backwards.

It is also an object of the present invention to provide a closed loop curved treadmill belt in a concave shape supported by end rollers in a low friction manner in a substantial stationary frame.

It is also an object of the present invention to provide a curved treadmill that assumes a concave upper contour and a taut lower portion.

Other objects which become apparent from the following description of the present invention.

## SUMMARY OF THE INVENTION

The present invention is a motor-less leg-powered curved treadmill produced wherein the curved, low friction surface allows people to walk, jog, run, and sprint without making any adjustments to the treadmill other than shifting the user's center of gravity forward and backwards. This novel speed control due to the curve allows people of any weight and size to adjust their own speed in fractions of a second. The user controls the speed by positioning their body along the curved running surface. Stepping forward initiates movement, as the user propels themselves up the curve the speed increases. To slow down, the user simply drifts back towards the rear curve. For running athletes, no handrails are needed. Handrails are optional for non-athletes with balance or stability limitations. The motor-less leg-powered treadmill permits low foot impact on the running surface through its new design, forcing the user to run correctly on the ball of the feet and therefore reducing pressure and strain of the leg joints. This unique design of the curve in a low friction surface allows any user, regardless of weight and size, to find and maintain the speed they desire. The user steps on the concave curved treadmill belt section and begins walking, steps up further and begins running, steps up even farther and starts to sprint. When stepping backward the motor-less leg-powered treadmill will stop.

Utilizing a closed loop treadmill belt supported by end rollers in a low friction manner in a substantial stationary frame, the curved treadmill of this invention makes it possible for the user to experience a free running session, with the potential to have the real feeling of running, and the ability to stop and sprint and walk instantly, thereby simulating running outside on a running track. This novel speed control in running was not possible in the prior art because of the lack of curved low friction running surfaces.

The closed loop treadmill belt must be of such a length as compared to the distance between the end rollers to permit it to assume the required concave upper contour. To keep it in that configuration in all operational modes, a method of slackening the curved upper portion while simultaneously keeping the lower portion taut (i.e.—preventing it from drooping down) is used. This method must not add significant friction to the treadmill belt since this would detract from the running experience of the user.

Several methods of controlling the treadmill belt configuration in a low friction manner are described. One method is to use a support belt under the treadmill belt lower portion. This support belt is kept in a taut configuration with a horizontal section by using springs pulling pulleys in opposite directions.

Another method uses a timing belt linking the treadmill belt end rollers such that after the desired configuration is achieved, the treadmill belt and end rollers must move synchronously thereby denying the treadmill belt the opportunity to have its lower section droop down.

Yet another method is to support the lower section of the treadmill belt from drooping down by directly supporting this section with one or more linear arrays of low friction bearings at the peripheral edges of the belt below the lower section.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention can best be understood in connection with the accompanying drawings. It is noted that the invention is not limited to the precise embodiments shown in drawings, in which:

FIG. 1 is a perspective view of the exterior of one embodiment of the present invention; showing the runner in a slow walk in the droop of the concave upper portion of the treadmill belt.

FIG. 1A is a perspective view of the exterior of the embodiment in FIG. 1, showing the runner running at a fast pace uphill.

FIG. 1B is a perspective view of the exterior of the embodiment in FIG. 1, showing the runner running slowly in the droop of the concave portion.

FIG. 2 is a diagrammatic side view of the system components for the embodiment of FIG. 1 for implementing the present invention.

FIG. 3 is a diagrammatic side view of the system components for a second embodiment for implementing the present invention.

FIG. 4 is a diagrammatic side view of the system components for a third embodiment for implementing the present invention.

## DETAILED DESCRIPTION OF THE DRAWINGS

The description of the invention which follows, together with the accompanying drawing should not be construed as limiting the invention to the example shown and described, because those skilled in the art to which this invention appertains will be able to devise other forms thereof.

FIG. 1 is a perspective view of a leg-powered treadmill 10 constructed and having an operating mode according to the present invention.

As noted in FIG. 1, no hand rails are shown. The curved treadmill 10 can be used without hand rails. Hand rails can be optionally provided for non-athletes with balance or running stabilities limitations.

Illustrated are two leg supports 10 and 12 which lift the treadmill 14 in a clearance position above a support surface 16, said treadmill 10 having space apart sides 18 and 20 which have journalled for rotation end rollers 22 and 24 which support a closed loop treadmill belt 26. Low friction methods to be described are used to hold taut the length of the lower belt portion 26A in a dimension of approximately forty-three inches denoted by dimension line 30. The upper belt portion 26B weighs approximately forty pounds is also denoted by the dimension line 30.

It is to be noted that an essential feature of treadmill 10 is a concave shape subtending an acute angle 34 in the treadmill 10 front end 14A which in practice results in the exerciser 36 running uphill and concomitantly exerting body weight 38 that contributes to driving lengthwise 40 in the direction 42 in which the exerciser runs and achieves the benefits of the exercise. As the runner 36 encounters the different positions on the treadmill belt 26 of the treadmill 14, the angle of the surface of running changes. For example, as shown in FIG. 1, when the center of gravity of body weight, indicated by downward directional arrow 38, below the hips of the user 36, is in the lower dropping portion of the concave upper portion 26B of the treadmill belt 26, the runner 36 walks or slowly jogs in a generally horizontal orientation, as indicated by directional arrow 42 in a first slow jogging speed. But, as shown in FIG. 1A, as the runner 36 speeds up and advances the runner's hips and center of gravity of body weight further forward up the angled slope at the front end 14A of the treadmill belt 26, the angle of movement 42 changes from a generally horizontal angle 42 in FIG. 1 to an acute angle 42 up off the horizontal as in FIG. 1A, which concurrently causes the runner 36 to run vigorously faster, at the acute angle 42 up the slope of the front 14A of the concave curve of upper belt portion 26B of treadmill belt 26, the runner 36 runs faster uphill. Furthermore, as shown in FIG. 1B, it does not matter where the runner 36 puts the forward foot to change the speed. In FIG. 1B the center of gravity in the hip region of the runner 36's body weight, indicated by downward directional arrow 38, is still in the lower part of the concave droop of the upper portion 26A of treadmill belt 26. So even though the runner 36 in FIG. 1B is jogging faster than walking or slowly jogging as in FIG. 1, so long as the runner 36 has the forward foot partially up the angled slope of the forward portion 14A of the upper belt portion 26B, the runner will still run slower in FIG. 1B, not because the forward foot is up the slope of upper belt portion 26B of the treadmill belt 26, but because the center of gravity of body weight, as indicated by downward directional arrow 38, is still within the lower confines of the droop of the concave upper belt portion 26B. Therefore, what changes the speed of the runner 36 and the treadmill belt 26, is when the runner 36 moves the center of gravity of the hips of the body weight indicated by downward directional arrow 38 higher up the slope of concave upper portion 26B of treadmill belt 26, which causes the runner to run faster and the belt 26 to concurrently move faster around pulleys 22 and 24 with the pace of the forward advancing runner 36.

It is known from common experience that in prior art treadmills, the upper length portion of their closed loops are flat due, it is believed, because of the inability to maintain the concave shape 34 in the length portion 26B. This shortcoming

is overcome by the weight 30 which in practice has been found to hold the concave shape 34 during the uphill running of the exerciser 36.

A closed loop treadmill belt 26 is formed with a running surface of transverse wooden, plastic or rubber slats 49 (see FIG. 1) attached to each other in a resilient fashion. Since an essential feature of treadmill 10 is the concave shape of the low friction running surface of belt 26 in upper portion 26B, methods are used to insure that this shape is maintained during actual use. These methods must prevent the lower portion 26A of treadmill belt 26 from drooping down (i.e.—must be held taut), otherwise top portion 26B would be pulled taut into a flat shape between rollers 22 and 24. Three methods are illustrated by the side view schematic drawings of FIGS. 2-4.

The method of FIG. 2 shows a flat support belt loop 50 engaged with two side pulleys 54 and a third pulley 56 which is attached to treadmill 10 frame. Two springs 52 pulling in opposite directions hold belt 50 taut with a flat top configuration in contact with bottom treadmill belt portion 26A. Since pulleys 54 and 52 are low friction, and there is no relative movement between belt 50 and belt 26, belt 50 imposes very little drag on belt 26 while supporting lower belt portion 26A vertically preventing it from drooping down.

The method shown in FIG. 3 shows the use of a timing belt 67 in achieving a similar result. Here end rollers 60 and 64 are attached to timing belt pulleys 62 and 66 respectively. Timing belt idlers 68 are simply used to configure timing belt geometrically to fit within the constraints of the side contours of treadmill 10. If belt 26 is prevented from slipping relative to end rollers 60 and 64 by high friction coefficient (or by the use of an integral timing belt on the inside of belt 26 and rollers with timing belt engagement grooves), once configured as shown, timing belt 67 will not permit drooping down of section 26A since all motion is now synchronous.

In another method shown in FIG. 4, one or more linear arrays of bearings 70 extending along opposite peripheral edges of said treadmill frame physically support lower section 26A of treadmill belt 26 thereby preventing drooping. Bearings 70 may be ball bearings or straight ball bearing casters attached and located at respective side peripheral edges to the bottom surface of the frame of treadmill 10.

In the foregoing description, certain terms and visual depictions are used to illustrate the preferred embodiment. However, no unnecessary limitations are to be construed by the terms used or illustrations depicted, beyond what is shown in the prior art, since the terms and illustrations are exemplary only, and are not meant to limit the scope of the present invention.

It is further known that other modifications may be made to the present invention, without departing the scope of the invention, as noted in the appended Claims.

I claim:

1. A motor-less, leg-powered treadmill comprising:
  - a treadmill frame;
  - a set of respective front and rear pulley end rollers for rotation, said front and rear pulleys supporting a closed loop treadmill belt;
  - said closed loop treadmill belt comprising a plurality of parallel slats oriented perpendicular to an axis of rotation of said belt, said parallel slats attached to each other in a resilient fashion;
  - said closed loop treadmill belt being of such a length as compared to the distance between the end rollers to permit it to assume a required concave upper contour;
  - a means for slackening an upper concave portion of said closed loop treadmill belt while simultaneously keeping

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a lower portion of said closed loop treadmill belt taut, preventing said lower portion from drooping down during rotation and exertion of walking or miming force upon said upper concave portion of said closed loop treadmill belt, said means for slackening the upper portion while simultaneously keeping the lower portion taut, preventing said lower portion from drooping down during rotation and exertion of walking or running force upon said upper concave portion of said closed loop treadmill belt comprises a timing belt having respective timing belt pulleys attached to said front and rear pulley

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rollers for said closed loop treadmill belt, wherein timing belt idlers are used to configure said timing belt geometrically to fit within constraints of side contours of said treadmill, wherein if said closed loop treadmill belt is prevented from slipping relative to said end rollers by a high friction coefficient, once configured, said timing belt will not permit drooping down of said lower taut portion of said closed loop treadmill belt because all respective motion is synchronous.

\* \* \* \* \*



UNITED STATES PATENT AND TRADEMARK OFFICE  
**CERTIFICATE OF CORRECTION**

PATENT NO. : 8,308,619 B1  
APPLICATION NO. : 12/925770  
DATED : November 13, 2012  
INVENTOR(S) : Aurel A. Astilean and Dan Bostan

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

ON THE TITLE PAGE

ITEM 12 SHOULD READ  
ASTILEAN ET AL.

ITEM 76 SHOULD READ  
Inventor(s): Aurel A. Astilean, East Hampton, NY (US); and  
Dan Bostan, Beaconsfield, QC H9w (CANADA)

Signed and Sealed this  
Twenty-sixth Day of January, 2016



Michelle K. Lee  
*Director of the United States Patent and Trademark Office*